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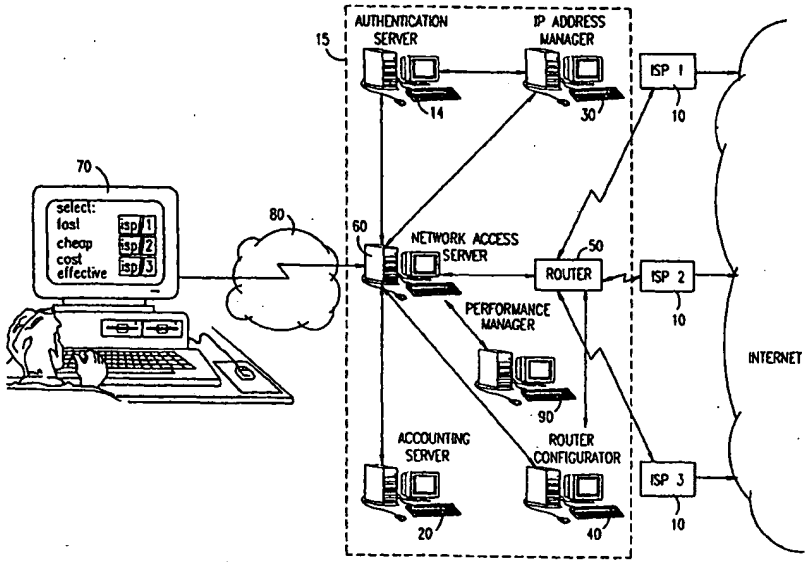

(57) Abstract

A system for connecting to Internet service providers via networking circuitry, the system including a user interface operative to display information regarding a plurality of Internet service providers including quality of service information and to accept a user's choice of an Internet service provider from among the plurality of Internet service providers, thereby to define a user-selected Internet service provider, and a configurator operative to connect the user to the user-selected Internet service provider by generating an on-the-fly configuration of the networking circuitry.

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APPARATUS AND METHODS FOR CONNECTING A NETWORK USER TO A NETWORK SERVICE PROVIDER

FIELD OF THE INVENTION

The present invention relates to apparatus and methods for connecting a user to a network such as the Internet, and in particular to providing connections between users and ISPs (Internet Service Providers).

BACKGROUND OF THE INVENTION

A plethora of ISPs (Internet service providers) are in operation which provide access to the Internet. Users must sign up with each ISP directly and cannot switch between ISPs on the fly.

It is well-known in the art for an ISP to provide its own POP (point of presence) in every local area where the ISP wishes to provide connection service for individual users. Typically, the ISP establishes, for each POP, an office including a defined number of telephone lines, each telephone line being associated with a modem, an ISDN connection, or similar terminal equipment, and each telephone line being intended to support a single individual user dial-in connection. Typically, multiplexing equipment, routing equipment, and other communications equipment is provided locally at the POP to complete the connection between the individual user and the Internet.

The RADIUS (Remote Authentication Dial In User Service) protocol, described in RFC 2138 and RFC 2139, both dated April 1997 and both published by the Internet Engineering Task Force can be used to remotely authenticate a dial-in user of a computer service.

IP addressing rules related to the field of the present invention are described in RFC 1918 of the Internet Engineering Task Force.

Inverse Network Technology, Inc. generates performance profiles for various Internet Service Providers.

ISP Alliance, Inc. provides a shared cost, transparent services system which allows a subscriber to provide Internet services to customers without actually

having the infrastructure to provide the Internet services.

The disclosures of all references mentioned above and throughout the present specification are hereby incorporated herein by reference.

SUMMARY OF THE INVENTION

The present invention seeks to provide improved apparatus and methods for connecting a user to a network such as the Internet.

There is thus provided in accordance with a preferred embodiment of the present invention a system for connecting to Internet service providers via networking circuitry, the system including a user interface operative to accept a user's choice of an Internet service provider from among a plurality of Internet service providers and a configurator operative to connect the user to the user-selected Internet service provider by generating an on-the-fly configuration of the networking circuitry.

The user interface may include a web-based display. The term "web-based display" is used throughout the present specification and claims to refer to an HTML (Hypertext Markup Language) or similar page that may be viewed by a standard WWW browser or a similar program.

The user interface may include a display of at least some of the plurality of Internet service providers.

Preferably, initial communications between user and the system of the present invention, until selection of an ISP by the user, are carried out using IP protocol and the server of the system allocates an internal IP address to the user. Once the user selects an ISP, a second IP address is allocated to the user, from among a pool of IP addresses belonging to the selected ISP. The second IP address is used, typically via network address translation (NAT) as is well known in the art, as an external address representing the user to the Internet. The internal IP address is typically retained by the user until logging out of the system or hanging up the connection.

Preferably, a telephone company allocates to the system of the present invention a local number which any subscriber can dial. The subscriber connects to the system of the present invention via the telephone company and a conventional modem. Typically, the telephone company subscriber's telephone number functions as his or her login/password and no additional password need be assigned to him or her.

Preferably, the telephone company subscriber is billed for use of the system of the present invention, as part of their telephone bill, similar to billing of other special services provided over the telephone such as long distance service. The subscriber therefore does not need to provide his or her credit card number.

Also provided, in accordance with a preferred embodiment of the present invention, is a method for connecting to Internet service providers via networking circuitry, the method including displaying a list of a plurality of Internet service providers to a user, accepting a user's choice of an Internet service provider from among the plurality of Internet service providers, and connecting the user to the user-selected Internet service provider by generating an on-the-fly configuration of the networking circuitry.

There is also provided in accordance with another preferred embodiment of the present invention a system for connecting to Internet service providers via networking circuitry, the system including a user interface operative to display information regarding a plurality of Internet service providers including quality of service information and to accept a user's choice of an Internet service provider from among the plurality of Internet service providers, thereby to define a user-selected Internet service provider, and a configurator operative to connect the user to the user-selected Internet service provider by generating an on-the-fly configuration of the networking circuitry.

Further in accordance with a preferred embodiment of the present invention the user interface includes a web-based display.

Still further in accordance with a preferred embodiment of the present invention the user interface includes a display of at least some of the plurality of Internet service providers.

Additionally in accordance with a preferred embodiment of the present invention the system also includes user identification apparatus operative to identify the user.

Moreover in accordance with a preferred embodiment of the present invention the user identification apparatus is operative to identify the user based on a telephone number used by the user to establish a connection with the system.

There is also provided in accordance with another preferred embodiment of the present invention a method for connecting to Internet service providers via networking circuitry, the method including displaying information regarding a plurality of Internet service providers including quality of service information, accepting a user's choice of an Internet service provider from among the plurality of Internet service providers, thereby to define a user-selected Internet service provider, and connecting the

user to the user-selected Internet service provider by generating an on-the-fly configuration of the networking circuitry.

There is also provided in accordance with another preferred embodiment of the present invention a virtual point of presence (POP) including a routing center operative to communicate with a network user and with at least one Internet Service Provider (ISP) and to route communications therebetween, and an authentication and ISP routing center receiving an identification of the network user from the routing center and operative to authenticate the network user based, at least in part, on the identification of the network user, and to choose an ISP and to communicate an ISP identification identifying the ISP to the routing center, the routing center being operative, upon receipt of the ISP identification, to route communications from the network user to an ISP associated with the ISP identification.

Further in accordance with a preferred embodiment of the present invention the authentication and ISP routing center is operative to choose the ISP based on a telephone number of the network user.

Further in accordance with a preferred embodiment of the present invention the authentication and ISP routing center is operative to choose the ISP based, at least in part, on at least one of the following a telephone number of the network user, identifying information of the network user, and profile information of the network user.

Further in accordance with a preferred embodiment of the present invention the routing center is also operative to maintain accounting records of routing services performed for the network user and the ISP.

There is also provided in accordance with another preferred embodiment of the present invention a method for providing a virtual point of presence (POP) using a network routing center, the method including providing communications, from the network routing center, with a network user and with at least one Internet Service Provider (ISP), receiving an identification of the network user from the routing center, authenticating the network user based, at least in part, on the identification of the network user, choosing an ISP and communicating an ISP identification identifying the ISP to the routing center, and routing communications from the network user to an ISP associated with the ISP identification.

Further in accordance with a preferred embodiment of the present invention the method also includes storing utilization information in a database.

Still further in accordance with a preferred embodiment of the present invention the method also includes producing a report based on the utilization information.

There is also provided in accordance with another preferred embodiment of the present invention a payment processing method for processing payments over a network, the network including a routing center for routing communications between at least one user and at least one service provider, the method including establishing a connection, through the routing center, between a user and a service provider, routing communications, at the routing center, between the user and the service provider, requesting, through the service provider, an item associated with a payment, initiating, at the routing center, an authorization of the payment, and receiving, at the routing center, billing information including a request to pay the payment.

Further in accordance with a preferred embodiment of the present invention the method also includes paying the requested payment from the routing center.

Still further in accordance with a preferred embodiment of the present invention the paying step includes aggregating a plurality of requested payments into a single payment.

Additionally in accordance with a preferred embodiment of the present invention the service provider includes an Internet service provider (ISP), and the requesting step includes requesting an item from a World Wide Web (WWW) site.

Moreover in accordance with a preferred embodiment of the present invention the system includes an on-the-fly ISP performance monitor operative to monitor performance of at least one ISP on the fly and to supply at least one quality of service parameter to the user interface for display.

Further in accordance with a preferred embodiment of the present invention the system also includes an infrastructure leaser operative to lease network infrastructure to at least one Internet service provider.

Additionally in accordance with a preferred embodiment of the present invention the infrastructure leaser is operative to lease network infrastructure to at least one Internet service provider from among the plurality of Internet service providers.

Moreover in accordance with a preferred embodiment of the present invention the system also includes a resource utilization monitor operative to record

information regarding occurrence of at least one of the following situations with respect to network infrastructure leased by at least one Internet service provider: underutilization of the infrastructure leased by the at least one Internet service provider, and overutilization of the infrastructure leased by the at least one Internet service provider.

Further in accordance with a preferred embodiment of the present invention the recording step is performed on the fly.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated from the following detailed description, taken in conjunction with the drawings in which:

Fig. 1 is a simplified block diagram of apparatus, constructed and operative in accordance with a preferred embodiment of the present invention, for connecting a user to the Internet via any user-selected ISP from among a plurality of ISPs;

Fig. 2 is an example of a screen display of the home user's computer of Fig. 1;

Fig. 3 is a simplified flowchart illustration of a preferred method of operation for the apparatus of Fig. 1;

Fig. 4 is a simplified block diagram illustration of apparatus for providing a virtual POP (point of presence) to an ISP, the apparatus being constructed and operative in accordance with another preferred embodiment of the present invention;

Fig. 5 is a simplified flowchart illustration of a preferred method of operation of the apparatus of Fig. 4;

Fig. 6 is a simplified block diagram illustration of a preferred embodiment of the routing center of Fig. 4; and

Fig. 7 is a simplified flowchart illustration of a preferred method of operation of the apparatus of Fig. 1 or the apparatus of Fig. 4.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference is now made to Fig. 1 which is a simplified block diagram of apparatus 15, constructed and operative in accordance with a preferred embodiment of the present invention, for connecting a user to the Internet via any user-selected ISP from among a plurality of ISPs 10.

As shown, the apparatus of Fig. 1 includes the following sub-systems:

An authentication server 14 that validates if the user can use the service;

An accounting server/manager 20 that monitors the start and end of the connections to the service and to a specific ISP 10;

An IP address manager 30 that allocates and collects back IP addresses of each ISP 10. Typically, each ISP allocates a typically static pool of available IP addresses from the IP address pool assigned to that ISP and communicates information including the available IP addresses to the IP address manager 30 by any appropriate means. The IP address manager 30 keeps track of the available IP addresses for each ISP and allocates an appropriate IP address on demand. When a user disconnects from the ISP the IP address manager preferably reclaims the address for future users;

A router configuring engine 40 that configures the router 50 in order to connect the user to a desired ISP 10; and

A network access server (NAS) 60 is operative to generate an appropriate user interface, preferably a GUI (graphical user interface) that presents the user with the ISP 10 and their rates and enables the user to choose an ISP 10, change an ISP 10 and elect to disconnect from an ISP 10. Typically, the GUI comprises an HTML file sent by the NAS 60 to the computer 70 of the home user(VIA A NETWORK 80?). This HTML file is typically rendered as a GUI screen by the web browser of home computer 70.

Typically, the GUI displays to the user the speed of each ISP's connection to the Internet, where the displayed speed is preferably the actual speed from the user's perspective, but may alternatively comprise one or more speeds of components of the ISP's network.

Preferably, the GUI displays some or all of the following options:

1. Connect to fastest ISP.

2. Connect to cheapest ISP.

3. Connect to most cost-effective ISP.

Preferably, an ISP performance manager 90 is provided which monitors the performance level of each ISP 10 and generates quality of service statistics. The results are typically aggregated by time and statistics for the last measured period are typically shown to the user. Actual performance of an IDS may typically be based on the time required for the ISP performance manager 90 to perform a predefined set of tasks, such as retrieving specified Internet information or executing an Internet ping, through each ISP 10. Under this definition of actual performance, a shorter time to complete the task indicates greater actual performance.

Preferably, each ISP is provided with an ISP manager which allows each ISP to collect information such as currently connected user report, port monitoring, accounting and billing information.

Fig. 2 is an example of a screen display which may be generated by the GUI of NAS 60. As shown, the screen display includes a list of a plurality of ISPs 10 plus comparative data regarding each of the ISPs, thereby allowing a user to make an intelligent choice, for example, by pressing the appropriate "Connect" screen button.

Fig. 3 is a simplified flowchart illustration of a preferred method of operation for the apparatus of Fig. 1. As shown, in step 110, the user initially connects to NAS (Network Access Server) 60 (Fig. 1) via a network 80 such as a PSTN (Public Switched Telephone Network) or via the ISDN (Integrated Services Digital Network).

In step 120, the NAS 60 authenticates the user, using a suitable protocol such as the RADIUS (Remote Authentication Dial In User Service) protocol, which protocol is well-known in the art and is described in RFC 2138 and RFC 2139, both dated April 1997 and both published by the Internet Engineering Task Force. The authentication may succeed, for example, if:

a. the number called by the user is that of the central service, it being well known in the art, in the case of telephone numbers dedicated to a single ISP, to have a global service telephone number for Internet access, the global number being used from any location and switching to a local point of service being automatically accomplished; the present invention provides an analogous service for multiple ISPs; and

b. there is a CLID (calling number identification). In other words, optionally, each home computer 70 is assigned a caller ID. The user is prompted to enter his caller ID and the NAS 60 then performs a CLID procedure to determine whether the calling party is calling from a valid telephone number and is therefore an authorized user.

In step 130, the authentication server 14 then requests an IP (Internet Protocol) address for the user from the IP (Internet protocol) addresses manager 30. The IP address which is assigned for this purpose is typically an IP address from the IP address pool of the service provider, as described above. In the present invention, each user has a first IP address for the connection, which is allocated by the IP address manager 30 to the user when the connection is established and remains with the user until the user hangs up the call. Each user also may have a second IP address, dynamically allocated by the IP address manager 30 for communication with a given ISP. It is appreciated that the first IP address is used to establish the connection, to enable the user to view the HTML page which offers the user a choice of ISPs, and to enable the communication necessary to switch between ISPs, while the second IP address is used for communicating with the Internet. Typically, during operation of the present invention, the first IP address, when used by the user, is translated to the second IP address as necessary. Typically, the first IP address may be supplied by a pool of private IP addresses in accordance with RFC 1918.

In step 140, the user is connected to the internal network such as, for example, the network 15 of Fig. 1 including the NAS 60, the authentication server 14, the IP address manager 30, the central router 50, the accounting server 20, and the router configuration server 40.

In step 150, the user accesses the service HTML (Hyper Text Markup Language) home page from her or his browser. The system's server is acting as a worldwide web (WWW) server to the home user's client web browser and the user's browser renders the HTML web page into a viewable web page. The home page typically includes a list of available ISPs 10 and comparative data regarding each ISP 10, including the rate/s of the service, for example, as shown in Fig. 2.

In step 160, the user selects an ISP 10. The user may click on one of the displayed ISPs or alternatively, the user may click on one of the following GUI buttons, if provided:

1. Connect to fastest ISP.

2. Connect to cheapest ISP.

3. Connect to most cost-effective ISP.

In step 170, a RADIUS access-request message (including the selected ISP) is sent by the NAS 60 to the authentication server 14. The message requests the IP manager 30 to allocate an IP address for the connection, from the IP address pool of the user-selected ISP 10.

In step 180, the router configuring engine 40 configures the NAT (Network Address Translation) tables of the router 50 and the routing policies of the router 50 using a suitable protocol such a HTTP (Hyper Text Transfer Protocol) for communications therebetween.

From this time on, the user's IP frames are forwarded to the network of the user-selected ISP 10 and the user can connect to the Internet. Therefore (step 190), at this time NAS 60 sends a RADIUS start-accounting message to accounting manager 20.

At a suitable time (step 200), the user discontinues his connection to the current ISP 10, e.g. by pushing the disconnect button or by choosing a different ISP).

Following (step 210), NAS 60 sends a RADIUS stop-accounting message to accounting manager 20.

Accounting manager 20 returns the IP address of the ISP 10 to the IP address manager 30 (step 220).

When the user disconnects the call (step 230), the NAS 60 sends a RADIUS stop accounting message to the accounting manager 20 (step 240). The accounting manager 20 returns the IP addresses of the connection between the user and the system of Fig. 1, described above as the first IP address, and the IP for communication with the ISP 10, described above as the second IP address, to the IP address manager 30 (step 250).

A particular advantage of a preferred embodiment of the present invention is that each ISP need not establish a POP (point of presence) site in each area code within the ISP's customer base. Also, each ISP need not install and maintain its own billing and collecting system.

Another advantage of a preferred embodiment of the present invention is that it allows full scale Internet shopping without the user's having to give out his or her credit card number. Instead, payments for bought goods are charged on the customer's telephone bill.

Reference is now made to Fig. 4, which is a simplified block diagram illustration of apparatus for providing a virtual POP (point of presence) to an ISP, the apparatus being constructed and operative in accordance with another preferred embodiment of the present invention. The apparatus of Fig. 4 comprises a routing center 245, typically integrated with a telephone local access office (not shown), but alternatively functioning as a stand-along routing center.

The apparatus of Fig. 4 also typically comprises an authentication/ISP routing center (AIR) 252, which is provided with a telecommunications link, preferably a high-speed private IP network link, to the routing center 245. The AIR 252 typically comprises an authentication server 255, typically a RADIUS server as is well known in the art. The AIR 252 also typically comprises an ISP routing server 260, which is described in more detail below. The authentication server 255 and the ISP routing server 260 are preferably provided with an appropriate two-way communications link therebetween.

The apparatus of Fig. 4 also comprises at least one ISP 265. For purposes of simplicity of description, only one ISP 265 is shown in Fig. 4, but it is appreciated that typically a plurality of distinct ISPs 265 will be provided.

The operation of the apparatus of Fig. 4 is now briefly described. A user 270 of the apparatus of Fig. 4, the user 270 typically comprising a home computer user, establishes a telecommunications connection, typically a PSTN or ISDN connection, with the routing center 245, using methods well-known in the art. The routing center 245 reports the fact of the incoming call, typically together with identifying information such as, typically, the telephone number of the caller, to the AIR 252.

Within the AIR 252 the identifying information is passed to the authentication server 255 and is there authenticated, typically using RADIUS methods, as is well-known in the art. If the result of the authentication is a determination that the user is not authorized, this fact is passed back to the routing center 245, which typically terminates the call of the user 270. If the result of the authentication is a determination that the user is authorized, this fact, optionally including further identifying information

for the user, is passed to the ISP routing server 260.

The ISP routing server 260 determines to which ISP 265 the user 270 should be connected. A determination of an ISP 265 may be based on the telephone number chosen by the user 270, such that, from the point of view of the user 270, the apparatus of Fig. 4 presents a virtual ISP which functions identically, to the user 270, to a real conventional ISP. The telephone number may be obtained using Dialed Number Identification System (DNIS), as is well known in the art, or by other appropriate means. Alternatively, the determination of the ISP may be based, for example, in whole or in part, on any one or combination of the following: the telephone number of the user 270, which may be determined by a caller identification method, as is well-known in the art; identifying information and/or further identifying information of the user 270; profile information for the user 270, the profile information typically being stored by the ISP routing server 260; by a domain name selected by the user 270, and based on information, typically stored by the ISP routing server 260, indicating which one or more ISPs is preferred for that domain; or any other appropriate information.

After the ISP routing server 260 has determined the one ISP 265 to which the user 270 should be connected, the AIR 252 communicates the identity of the ISP to the routing center 245. The routing center 245 then sets up an appropriate routing definition, as is well-known in the art, and routes IP packets between the user 270 and the ISP 265, transparently to the user 270 and the ISP 265. Thus a virtual user-ISP connection, virtual in the sense that the physical link between the routing center 245 and the ISP 265 can be used to establish many such connections for a plurality of users, is established between the user 270 and the ISP 265, and thus the apparatus of Fig. 4 acts effectively as a virtual POP.

Preferably, the routing center 245 is operative to maintain accounting records of all connections from any user 270 to any ISP 265, the accounting records and the apparatus and methods used for maintaining the accounting records typically being similar to those well-known in the art in telephone central office systems. Preferably, accounting records maintained by the routing center 245 are used to report usage and/or charges to each ISP 265, or to directly invoice each user 270, typically in accordance with rates and regulations established by each ISP 265, for usage of each ISP 265. Alternatively or additionally, the accounting records may be used to charge each ISP 265 for routing services provided.

In the apparatus of Fig. 4 any appropriate communications link, such as a private network as is well-known in the art, may be used for communications between the routing center 245 and the AIR 252.

Reference is now made to Fig. 5, which is a simplified flowchart illustration of a preferred method of operation of the apparatus of Fig. 4. The method of Fig. 5 preferably includes the following steps:

Communications, typically in the form of an available channel for communications which may not yet be in active use, is provided, from a network routing center such as the network routing center 245 of Fig. 4, with a network user and with at least one ISP (step 275). Upon receipt of an identification of the network user from the routing center (step 280), typically as described above with reference to Fig. 4, the network user is typically authenticated (step 285). The authentication is based, at least in part, on the identification of the network user from step 280, and may also be based on a variety of other factors as described above with reference to Fig. 4. Such other factors might include, for example, smart token authentication, one-time password authentication, and smart-card based authentication, which are well-known in the art. Although it is believed to be preferable to include step 285 in the method of Fig. 5, it is appreciated that, in another preferred embodiment of the method of Fig. 5, step 285 may be omitted.

An ISP is chosen, typically based in part on a telephone number called by the user and/or on the authenticated identification of the user and/or on other factors, as described above with reference to Fig. 4; an ISP identification identifying the ISP is communicated to the routing center (step 290).

Communications are routed from the network user to an ISP associated with the ISP identification (step 300).

It will be appreciated by persons skilled in the art that the method of Fig. 5 provides network users and ISPs with a virtual point of presence. It will also be appreciated by persons skilled in the art that the method of Fig. 5 when used with the apparatus of Fig. 4, by consolidating the necessary infrastructure for a plurality of ISPs, allows pooling of unused resources that would, in a conventional prior art system, be unavoidably split between ISPs. Such pooled unused resources could be used for a variety of purposes such as, for example, to consolidate unused bandwidth during off peak hours for resale, such as, for example, for resale by ISPs as leased lines, typically

T1 or T3 lines.

Reference is now made to Fig. 6, which is a simplified block diagram illustration of a preferred embodiment of the routing center 245 of Fig. 4. It is appreciated, as described further below, that components of Fig. 6 may also be used in a preferred embodiment of the system of Fig. 1, to perform similar functions therein.

The apparatus of Fig. 6 preferably comprises a routing control unit 310. The routing control unit 310 may be operative, as described above with reference to Fig. 4, to perform the routing operations of the routing center 245 of Fig. 4.

The apparatus of Fig. 6 also preferably comprises a database subsystem 320 and a reporting subsystem 330. The database subsystem 320 and the reporting subsystem 330 may, if comprised in a preferred embodiment of the system of Fig. 1, be comprised, for example, in the accounting server 20 of Fig. 1, or in any other appropriate component of the system of Fig. 1.

The routing control unit 310, the database subsystem 320, and the reporting subsystem 330 are preferably implemented in any suitable combination of computer hardware and software, as is well-known in the art. The routing control unit 310, the database subsystem 320, and the reporting subsystem 330 are all preferably in operative communication with each other.

The operation of the apparatus of Fig. 6 is now briefly described. The routing control unit 310 reports its routing activities, typically but not necessarily including essentially all of its routing activities, to the database subsystem 320, which stores the reported activities in any appropriate database. Typically, routing activities reported include, for a combination of the operations of the system of Fig. 1 and the apparatus of Fig. 4, one or more of the following: user requests to connect to a particular ISP; automatic user connection to an ISP; length of user session; number of packets and/or bytes transferred during user session; charges allocated to users, ISPs, or others; and any other appropriate available information on the usage and operation of the system of Fig. 1 and/or the apparatus of Fig. 4.

The reporting system 330 is operative, typically upon receipt of a request from an administrative user of the system and/or periodically, to analyze some or all of the information comprised in the database maintained by the database subsystem 320 and to generate reports based thereon. It is appreciated that a very wide variety of reports could thus be generated. Some examples of information which might typically be

included in such a report include the following:

utilization of infrastructure, such as, for example, phone lines and communications bandwidth, by ISP or other service provider, by type of port or connection, by IP address, or by any other appropriate factor;

distribution of calls between network access servers, between ISPs or other service providers, or otherwise;

detection of possible system bottlenecks or potential future system bottlenecks;

planning projections of future system usage based on current system usage;

revenue reports;

availability and unavailability reports, due to system faults or other events;

service utilization reports;

reports on the impact of known promotional activities on system usage; and

any of the above reports according to hours of the day, days of the week, and/or peak and off peak hours and/or days;

It is appreciated that, given the apparatus of Figs. 1, 4, and 6 and the above description, a person skilled in the art could produce the above reports using methods well known in the art, particular in the fields of database systems and management reporting.

Reference is now made to Fig. 7, which is a simplified flowchart illustration of a preferred method of operation of the apparatus of Fig. 1 or the apparatus of Fig. 4. The method of Fig. 7 will be described primarily with implicit reference to Fig. 4, it being appreciated that a person skilled in the art could also use the method of Fig. 7 with the apparatus of Fig. 1. It is also appreciated that the method of Fig. 7 is generally useful for accounting for payments internal to the systems of Fig. 1 and Fig. 4.

The method of Fig. 7 preferably includes the following steps:

A connection is established, through a routing center 245, between a user 270 and a service provider ISP 265 (step 340). The connection may be established using any appropriate method, typically as explained above with reference to Figs. 1 and 4, in which the routing center or a similar system component is responsible for maintaining

the connection between the user and the service provider. The routing center routes the communications between the user and the service provider (step 350), typically as explained above.

The user 270 requests, through the service provider an item associated with a payment (step 360). Without limiting the generality of the foregoing, typically the provider comprises an ISP and the user request is made through a site on the WWW, the site being accessed by the user via the ISP, and hence, transparently to the user, via the routing center.

At the point where payment is to be authorized, the authorization is initiated by the routing center (step 370), and the routing center receives thereafter billing information including a request to make the payment (step 380). Typically, in the case referred to above of a WWW site, the billing information originates at the WWW site.

The following steps are typically performed but are optional: The routing center aggregates a plurality of requested payments into a single payment (step 390) and pays the requested payment, typically an aggregated payment (step 400). It is appreciated that payments in the WWW may be very small, and that therefore the ability to aggregate small payments, including small payments from different users, and to pay in a single aggregated payment is preferably included in the method of Fig. 7.

It is appreciated that the software components of the present invention may, if desired, be implemented in ROM (read-only memory) form. The software components may, generally, be implemented in hardware, if desired, using conventional techniques.

It is appreciated that various features of the invention which are, for clarity, described in the contexts of separate embodiments may also be provided in combination in a single embodiment. Conversely, various features of the invention which are, for brevity, described in the context of a single embodiment may also be provided separately or in any suitable subcombination.

It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather, the scope of the present invention is defined only by the claims that follow:

CLAIMS

1. A system for connecting to Internet service providers via networking circuitry, the system comprising:

a user interface operative to display information regarding a plurality of Internet service providers including quality of service information and to accept a user's choice of an Internet service provider from among the plurality of Internet service providers, thereby to define a user-selected Internet service provider; and

a configurator operative to connect the user to the user-selected Internet service provider by generating an on-the-fly configuration of the networking circuitry.

2. A system according to claim 1 wherein the user interface comprises a web-based display.

3. A system according to claim 1 or claim 2 wherein the user interface comprises a display of at least some of the plurality of Internet service providers.

4. A system according to claim 1 or claim 2 and also comprising user identification apparatus operative to identify the user.

5. A system according to claim 4 and wherein the user identification apparatus is operative to identify the user based on a telephone number used by the user to establish a connection with the system.

6. A method for connecting to Internet service providers via networking circuitry, the method comprising:

displaying information regarding a plurality of Internet service providers including quality of service information;

accepting a user's choice of an Internet service provider from among the plurality of Internet service providers, thereby to define a user-selected Internet service provider; and

connecting the user to the user-selected Internet service provider by generating an on-the-fly configuration of the networking circuitry.

7. A virtual point of presence (POP) comprising:

a routing center operative to communicate with a network user and with at least one Internet Service Provider (ISP) and to route communications therebetween; and

an authentication and ISP routing center receiving an identification of the network user from the routing center and operative:

to authenticate the network user based, at least in part, on the identification of the network user; and

to choose an ISP and to communicate an ISP identification identifying the ISP to the routing center,

wherein the routing center is operative, upon receipt of the ISP identification, to route communications from the network user to an ISP associated with the ISP identification.

8. Apparatus according to claim 7 and wherein the authentication and ISP routing center is operative to choose the ISP based on a telephone number of the network user.

9. Apparatus according to claim 7 wherein the authentication and ISP routing center is operative to choose the ISP based, at least in part, on at least one of the following: a telephone number of the network user; identifying information of the network user; and profile information of the network user.

10. Apparatus according to claim 7 and wherein the routing center is also operative to maintain accounting records of routing services performed for the network user and the ISP.

11. A method for providing a virtual point of presence (POP) using a network routing center, the method comprising:

providing communications, from the network routing center, with a network user and with at least one Internet Service Provider (ISP);

receiving an identification of the network user from the routing center;

authenticating the network user based, at least in part, on the identification of the network user;

choosing an ISP and communicating an ISP identification identifying the ISP to the routing center; and

routing communications from the network user to an ISP associated with the ISP identification.

12. A method according to claim 6 or claim 11 and also comprising:

storing utilization information in a database.

13. A method according to claim 12 and also comprising:

producing a report based on the utilization information.

14. A payment processing method for processing payments over a network, the network comprising a routing center for routing communications between at least one user and at least one service provider, the method comprising:

establishing a connection, through the routing center, between a user and a service provider;

routing communications, at the routing center, between the user and the service provider;

requesting, through the service provider, an item associated with a payment;

initiating, at the routing center, an authorization of the payment; and

receiving, at the routing center, billing information including a request to pay the payment.

15. A method according to claim 14 and also comprising:

paying the requested payment from the routing center.

16. A method according to claim 15 and also wherein the paying step comprises:

aggregating a plurality of requested payments into a single payment.

17. A method according to any of claims 14 - 16 and wherein the service provider comprises an Internet service provider (ISP), and

the requesting step comprises requesting an item from a World Wide Web (WWW) site.

18. A system according to claim 1 and also comprising an on-the-fly ISP performance monitor operative to monitor performance of at least one ISP on the fly and to supply at least one quality of service parameter to the user interface for display.

19. A system according to claim 1 and also comprising an infrastructure leaser operative to lease network infrastructure to at least one Internet service provider.

20. A system according to claim 19 wherein the infrastructure leaser is operative to lease network infrastructure to at least one Internet service provider from among said plurality of Internet service providers.

21. A system according to claim 19 and also comprising a resource utilization monitor operative to record information regarding occurrence of at least one of the following situations with respect to network infrastructure leased by at least one Internet service provider:

underutilization of the infrastructure leased by the at least one Internet service provider; and

overutilization of the infrastructure leased by the at least one Internet service provider.

22. A system according to claim 21 wherein said recording step is performed on the fly.

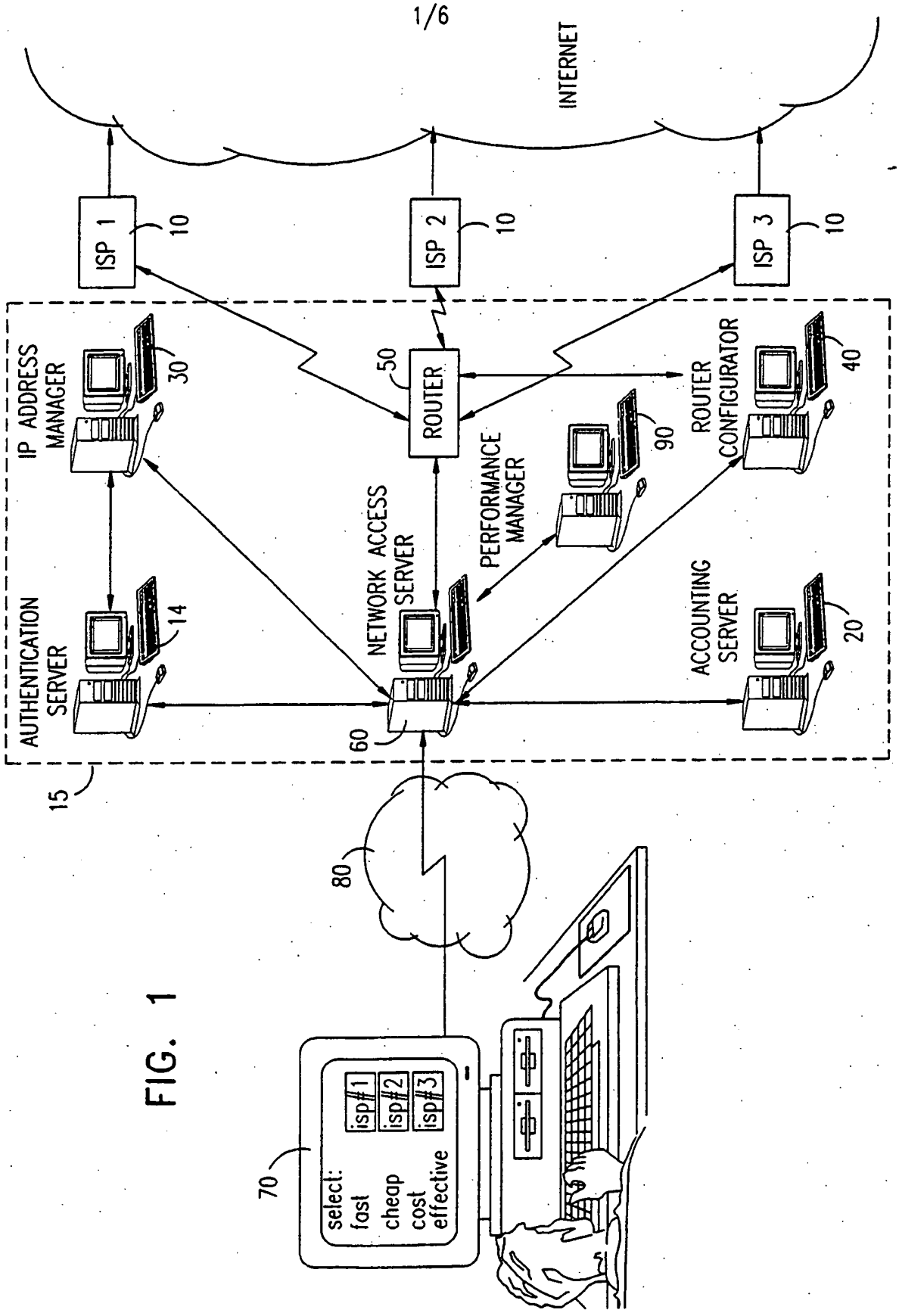
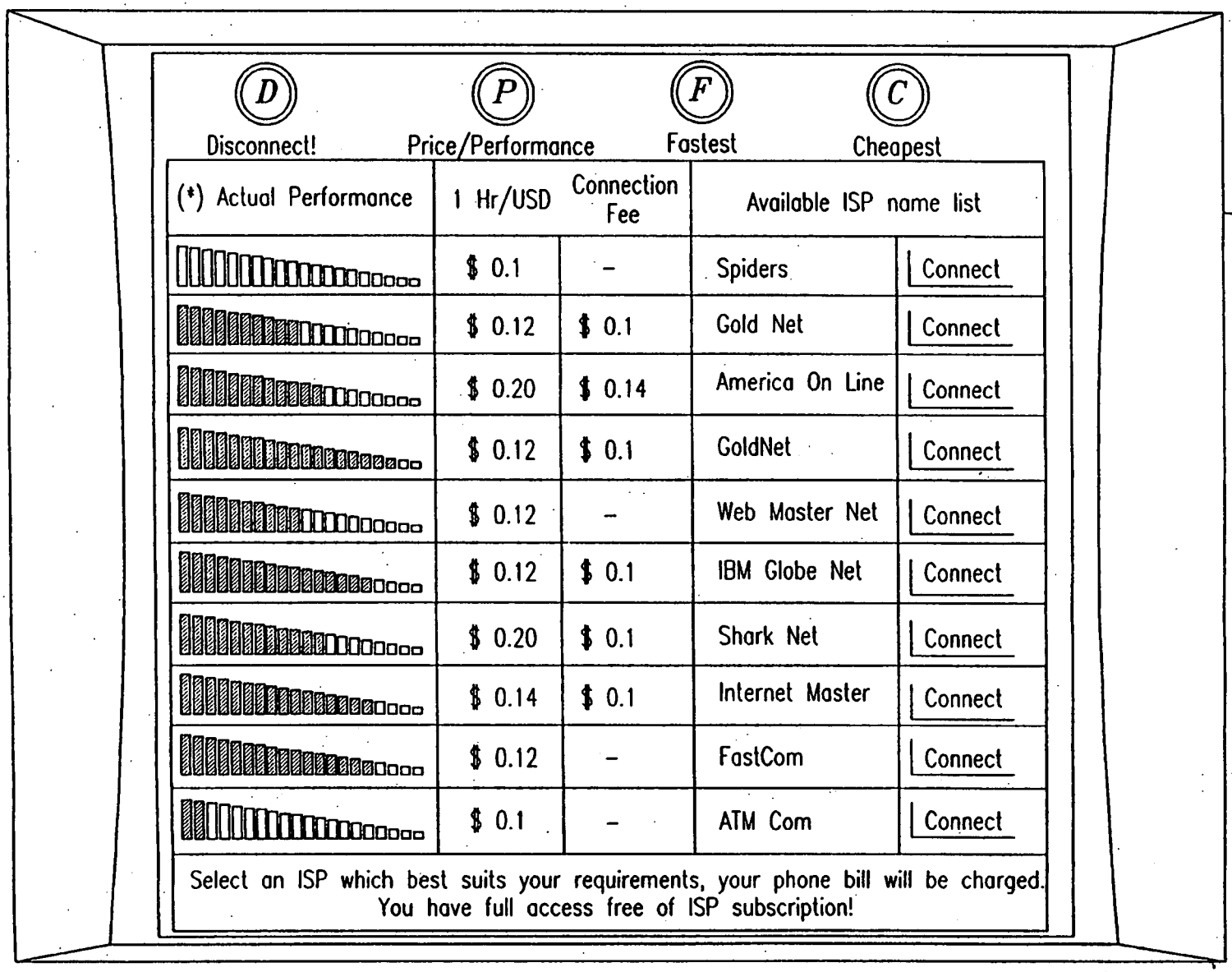

INTERNET
ISP 1
10
ISP 2
10
ISP 3
10
IP ADDRESS MANAGER
30
ROUTER
50
ROUTER CONFIGURATOR
40
PERFORMANCE MANAGER
90
NETWORK ACCESS SERVER
AUTHENTICATION SERVER
14
ACCOUNTING SERVER
20
60
15
80
70
select:
fast
cheap
cost effective
isp#1
isp#2
isp#3

FIG. 1


D
Disconnect!
P
Price/Performance
F
Fastest
C
Cheapest
(*) Actual Performance
1 Hr/USD
Connection Fee
Available ISP name list
$ 0.1 – Spiders Connect
$ 0.12 $ 0.1 Gold Net Connect
$ 0.20 $ 0.14 America On Line Connect
$ 0.12 $ 0.1 GoldNet Connect
$ 0.12 – Web Master Net Connect
$ 0.12 $ 0.1 IBM Globe Net Connect
$ 0.20 $ 0.1 Shark Net Connect
$ 0.14 $ 0.1 Internet Master Connect
$ 0.12 – FastCom Connect
$ 0.1 – ATM Com Connect
Select an ISP which best suits your requirements, your phone bill will be charged.
You have full access free of ISP subscription!

70

FIG. 2

FIG. 3

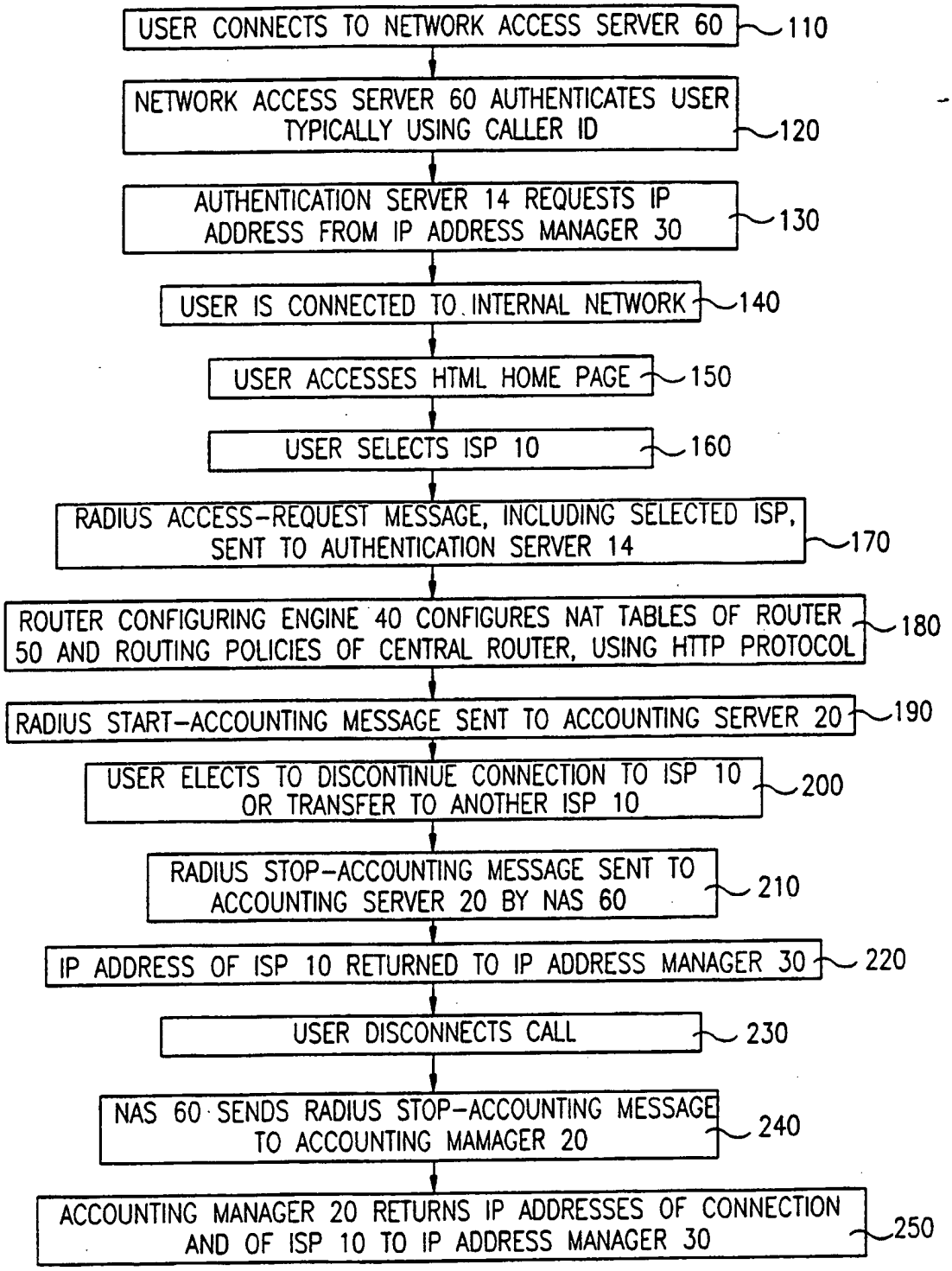

USER CONNECTS TO NETWORK ACCESS SERVER 60
110
NETWORK ACCESS SERVER 60 AUTHENTICATES USER TYPICALLY USING CALLER ID
120
AUTHENTICATION SERVER 14 REQUESTS IP ADDRESS FROM IP ADDRESS MANAGER 30
130
USER IS CONNECTED TO INTERNAL NETWORK
140
USER ACCESSES HTML HOME PAGE
150
USER SELECTS ISP 10
160
RADIUS ACCESS-REQUEST MESSAGE, INCLUDING SELECTED ISP, SENT TO AUTHENTICATION SERVER 14
170
ROUTER CONFIGURING ENGINE 40 CONFIGURES NAT TABLES OF ROUTER 50 AND ROUTING POLICIES OF CENTRAL ROUTER, USING HTTP PROTOCOL
180
RADIUS START-ACCOUNTING MESSAGE SENT TO ACCOUNTING SERVER 20
190
USER ELECTS TO DISCONTINUE CONNECTION TO ISP 10 OR TRANSFER TO ANOTHER ISP 10
200
RADIUS STOP-ACCOUNTING MESSAGE SENT TO ACCOUNTING SERVER 20 BY NAS 60
210
IP ADDRESS OF ISP 10 RETURNED TO IP ADDRESS MANAGER 30
220
USER DISCONNECTS CALL
230
NAS 60 SENDS RADIUS STOP-ACCOUNTING MESSAGE TO ACCOUNTING MAMAGER 20
240
ACCOUNTING MANAGER 20 RETURNS IP ADDRESSES OF CONNECTION AND OF ISP 10 TO IP ADDRESS MANAGER 30
250

FIG. 4

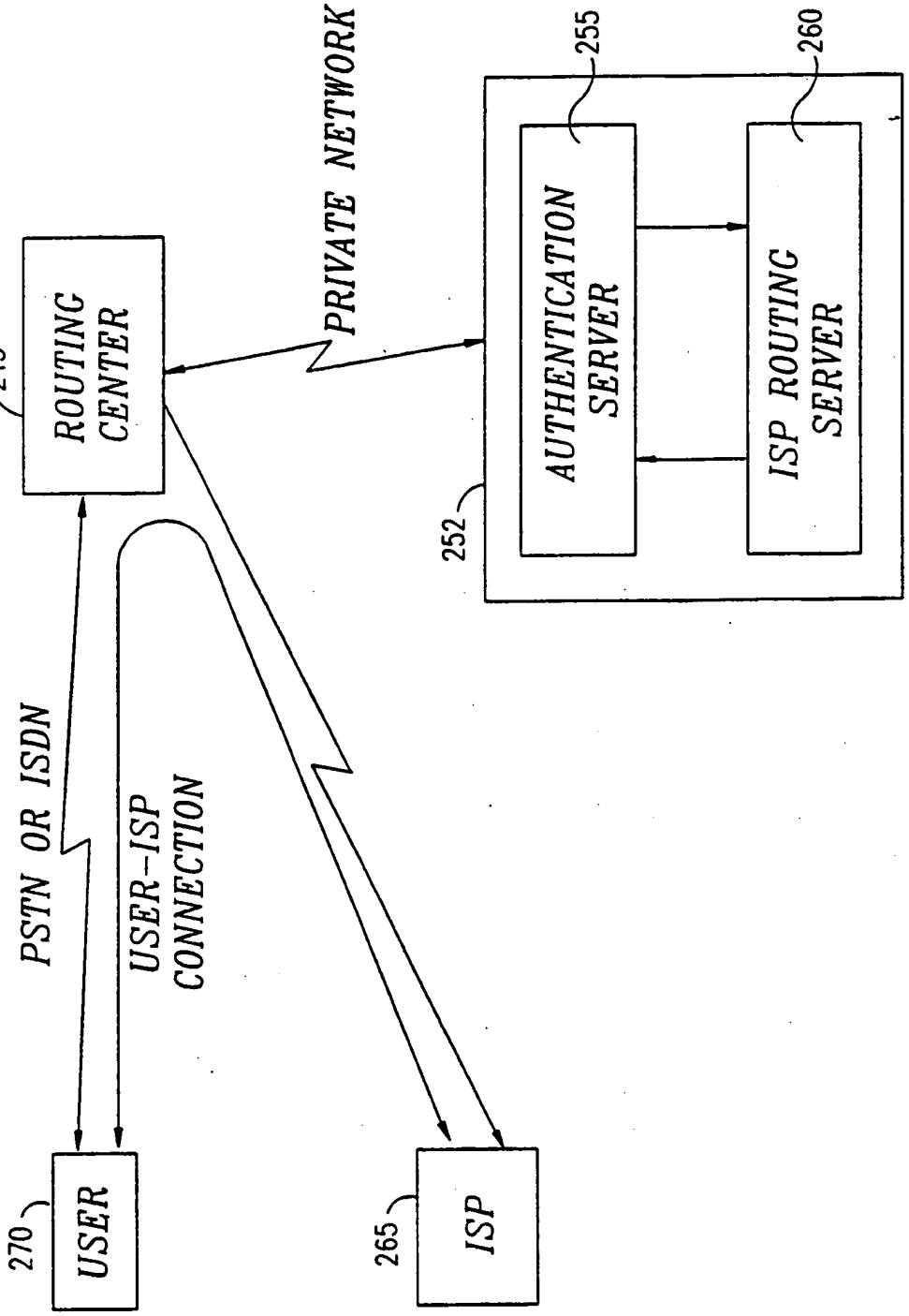

ROUTING CENTER
245
PRIVATE NETWORK
AUTHENTICATION SERVER
255
ISP ROUTING SERVER
260
252
PSTN OR ISDN
USER-ISP CONNECTION
USER
270
ISP
265

FIG. 5

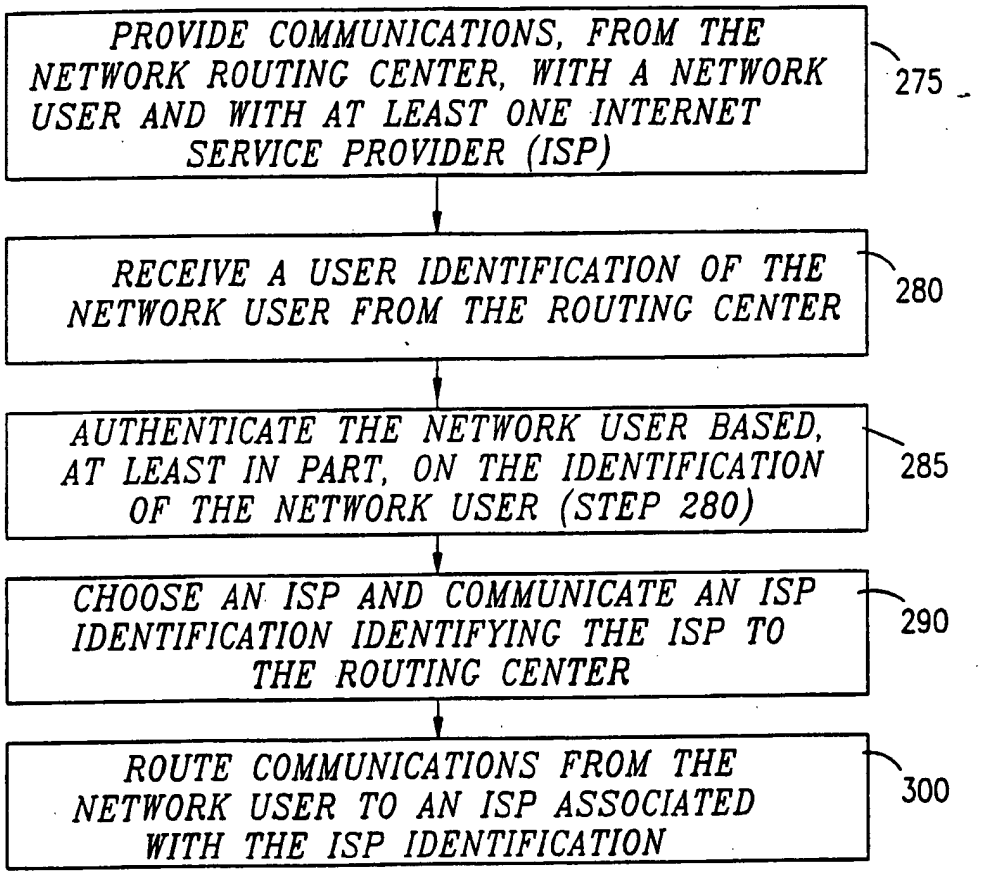

PROVIDE COMMUNICATIONS, FROM THE NETWORK ROUTING CENTER, WITH A NETWORK USER AND WITH AT LEAST ONE INTERNET SERVICE PROVIDER (ISP)
275
RECEIVE A USER IDENTIFICATION OF THE NETWORK USER FROM THE ROUTING CENTER
280
AUTHENTICATE THE NETWORK USER BASED, AT LEAST IN PART, ON THE IDENTIFICATION OF THE NETWORK USER (STEP 280)
285
CHOOSE AN ISP AND COMMUNICATE AN ISP IDENTIFICATION IDENTIFYING THE ISP TO THE ROUTING CENTER
290
ROUTE COMMUNICATIONS FROM THE NETWORK USER TO AN ISP ASSOCIATED WITH THE ISP IDENTIFICATION
300

FIG. 6

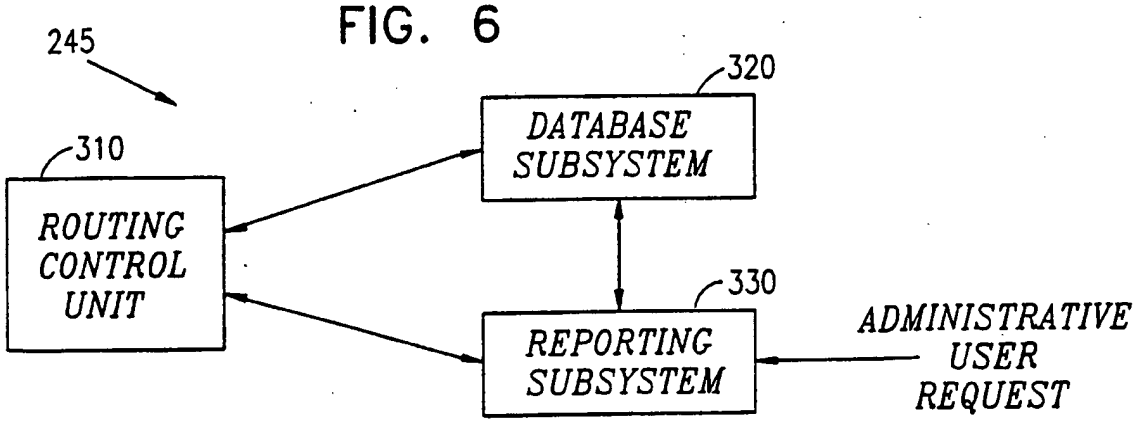
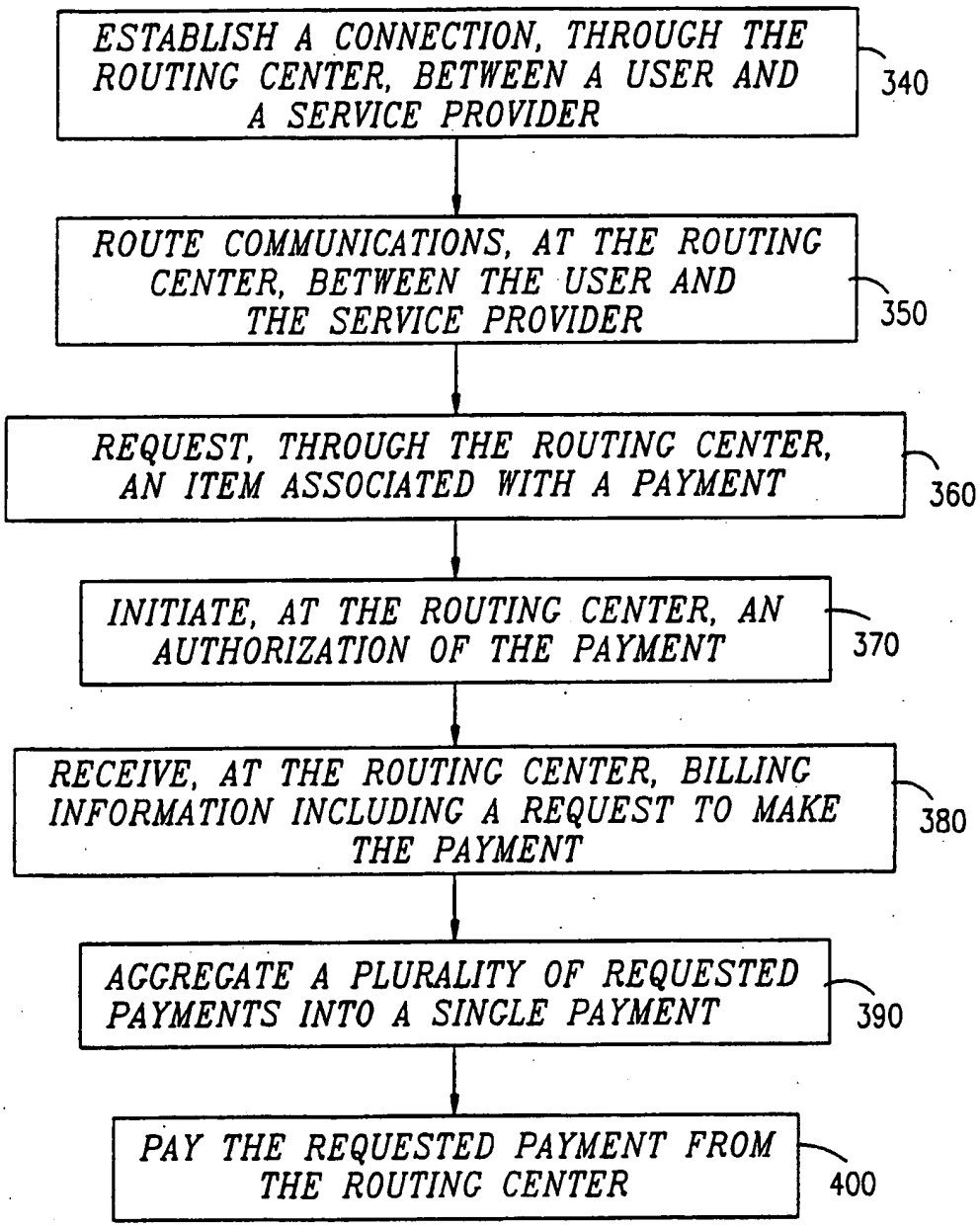

245
320
DATABASE SUBSYSTEM
310
ROUTING CONTROL UNIT
330
REPORTING SUBSYSTEM
ADMINISTRATIVE USER REQUEST

FIG. 7


ESTABLISH A CONNECTION, THROUGH THE ROUTING CENTER, BETWEEN A USER AND A SERVICE PROVIDER
340
ROUTE COMMUNICATIONS, AT THE ROUTING CENTER, BETWEEN THE USER AND THE SERVICE PROVIDER
350
REQUEST, THROUGH THE ROUTING CENTER, AN ITEM ASSOCIATED WITH A PAYMENT
360
INITIATE, AT THE ROUTING CENTER, AN AUTHORIZATION OF THE PAYMENT
370
RECEIVE, AT THE ROUTING CENTER, BILLING INFORMATION INCLUDING A REQUEST TO MAKE THE PAYMENT
380
AGGREGATE A PLURALITY OF REQUESTED PAYMENTS INTO A SINGLE PAYMENT
390
PAY THE REQUESTED PAYMENT FROM THE ROUTING CENTER
400